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DIARY OF A. F. TRESHNIKOV FOR THE 1954-1955 SOVIET POLAR EXPEDITION

Vodnyy Transport
Moscow, Jul, Aug 55

[Comment: This report contains published excerpts from the diary of A. F. Treshnikov, chief of the drift station Severnyy Polyus-3, which he kept during his stay on the ice.

All temperatures given are in degrees centigrade. Numbers in parentheses refer to appended sources.]

First Days

8 April 1954. The responsibility for locating a suitable ice floe for the establishment of the scientific station Severnyy Polyus-3 has been accorded to I. Kotov, polar aviator. Our station, with all necessary equipment, supplies, and instruments for life and work on the ice, will be established on the ice floe which he locates.

On the preliminary survey flights, of many hours duration, the chief of the prospective station traditionally accompanies the aircraft crew, so I went with Kotov. On these missions we flew according to navigator's directions to the area around the 86th parallel and the 180th meridian where it was intended to establish the scientific drift station. This area was flown over time and time again in order to locate an ice floe of sufficient strength and size. An oval floe was finally located with a length of about 3 kilometers and a width of about 2 kilometers. From the air it was noted that the surface of this floe was covered with sastrugi and crossed by hummocks. As a result of this uneven surface, our aircraft landed on the ice at a distance of 9 kilometers from the chosen camp site. The landing was effected without incident, tents were rapidly erected, and with the aid of bottled gas, a meal was cooked. After a short rest, the aircraft again took off to examine the neighboring area more closely.

On the following day, I. Kotov called for a light aircraft AN-2, which arrived after several hours piloted by M. Stupishin. We boarded this aircraft and after several minutes effected a landing on the ice floe which had been chosen for the scientific drift station. Upon our descent from the aircraft, we cut a hole in the ice to measure its thickness, which proved to be about 3 meters. This was definitely sufficient to support the weight required. We were accompanied on this trip by the photographer of Severnyy Polyus-3, Yevgeniy Pavlovich Yatsun. He was assigned the task of recording life and work of the drift station during the course of the year.

Around the ice floe a pressure ridge formed a broad wall reaching a height 6-8 meters in places. The surface of the ice was covered with a hard but irregular layer of snow.

After looking over the future camp site, we chose a landing area suitable for heavier aircraft. We began clearing this area slowly and smoothing its irregularites with shovels, which later proved to be of unparalleled value on the ice.

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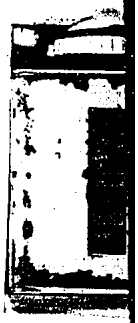


On 20 April, the flag ship of the high latitude expedition organized by Glavsevmorput' landed on the ice floe. On board the aircraft were Vasiliy Fedorovich Burkhanov, chief of the expedition, and his deputy Vyacheslav Vasil'yevich Frolov, director of the Arctic Scientific Research Institute. The ice floe which was selected for the scientific drift station Severnyy Polyus-3 was located at 86-00 N and 175-45 W, between Ostrov (island) Vrangelya and the North Pole. The station Severnyy Polyus-1, in 1937, was located further to the west and the station Severnyy Polyus-2 began its drift 13 years later at a point further to the south. Our station would be in the area of the North Pole, and it was expected that during the time of drift, we would pass over the submarine range imeni M. V. Lomonosov, which was discovered by Soviet scientists. This would permit a more precise study of bottom relief and the movement of ice and water masses in the Arctic Ocean.

A second scientific station Severnyy Polyus-4 was established in the area of the pole of relative inaccessibility.

The continued observation of the two stations on drifting ice would have a great significance for science and for the expansion of shipping on the Northern Sea route.

The staff of our station is made up of experienced polar workers, many of whom have wintered more than once in the Arctic and have taken part in Soviet high latitude expeditions. Those who will be working on drifting ice for the second time include Vasiliy Gavrilovich Kanaki, aerologist, Konstantin Mitrofanovich Kurko, radio operator, Mikhail Semenovich Komarov, mechanic, Dr Vitaliy Georgiyevich Volovich, Aleksandr Ivanovich Dmitriyev, hydrologists, and Yevgeniy Pavlovich Yatsun, photographer. All these men took part in the drift of scientific station Severnyy Polyus-2 in 1950-1951. The chief of the meteorological section, Georgiy Ivanovich Matveychuk, is an experienced worker as is his assistant Anatoliy Danilovich Malkov.

Several days ago, the ice floe was empty but now, on 16 April, an entire village has arisen. Tents have been erected for the radio station, aerological section, meteorological section, magnetological section, and the cook house. The astronomical pavilion has been constructed of snow block. The radio station is in regular operation with its chief operator Kurko and his young assistant Leonid Razbash giving radio directions to aircraft bringing cargo from the mainland to the drifting station.

We began work immediately at the camp. Meteorologists Matveychuk and Malkov and Magnetologist Nikolay Yevdokimovich Popkov have already set up their equipment, and the oceanography section has cut sounding holes through the 3-meters-thick ice. These holes are covered with tents which contain equipment built in the Arctic Scientific Research Institute.

The camp is operated on a very strict daily routine. Since the number of people at the site is so great, meals are served in three shifts. It has been officially decreed that all trash is to be placed in an area separated from the camp. This will be of particular importance with the approach of spring, since every scrap of paper will absorb solar heat and a circle of water will form around it. We have learned that from the experience of the drifting station Severnyy Polyus-2.

On 18 April, the solar day began. It was quiet and although the temperature was 24 degrees below zero it seemed quite warm. It was not long before a most unusual form of aircraft appeared over the camp. This was the helicopter, which was being seen for the first time by some members of our party. Our two dogs, however, Mamay and Bludnyy, were the only members of the station who were sufficiently frightened by the helicopter to take cover until it had landed and cut its engine. The crew of the helicopter was made up of four men commanded by Aleksey Fedorovich Babenko.

The flight by helicopter from Moscow to the Central Arctic had been completed for the first time, an important event in the history of aviation.

On the day of its arrival, the crew of the helicopter began work. They completed several trips to the nearby airdrome (a distance of 9 kilometers) where aircraft had delivered drums of fuel and heavy freight. The helicopter also delivered GAZ-69 trucks which had been delivered to the airdrome by IL-12 aircraft. Unloaded from the IL-12, the trucks were driven under their own power into the fuselage of the helicopter which then delivered them to the station. An unassembled tractor was also delivered to the station by aircraft.

Pilot I. Kotov has arrived at the camp delivering among other cargo gasoline generators and equipment required by the aerological section. Vasiliy Gavrilovich Kanaki, Platon Platonovich Poslavskiy, and the youngest member of our station, Igor' Tsigel'nitskiy, were thus ready to begin the launching of radiosondes.

Kanaki is an experienced polar worker. He has worked in the Arctic since 1932, wintering on Novaya Zemlya and Zemlya Frantsa-Iosifa, and taking part in high latitude expeditions in the area of the pole of relative inaccessibility and in the drift of the scientific station Severnyy Polyus-2. Platon Platonovich Poslavskiy, who is working for the 20th year in the Far North, still recalls the time when only two or three houses stood in Bukhta Tiksi, which is now a very large polar settlement. The third aerologist, Igor' Tsigel'nitskiy, is only 22 years old, and our station is his first wintering place in the Arctic.(1)

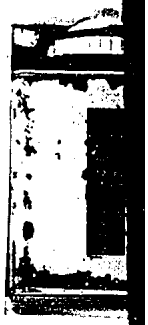
Observations Are Begun

On 20 April, our ice floe was located at 86-31-09 N and 177-13-03 W. On this date, daily measurements of the ocean depth were begun. On the first day, Hydrologist Vladimir Aleksandrovich Shamont'yev and his assistants entered the hydrological tent where a hole had been previously cut in the ice and a hydrological winch installed for measurement purposes. The first reading obtained was 3,938 meters. This figure was the first to be used on the bathymetric chart of the station Severnyy Polyus-3.

Life at the drift station has already formed into a regular routine of work, with all divisions taking systematic observations. The hydrologists are taking water temperatures at various levels and gathering water samples for determination of chemical composition. They are also using a special net for taking small samples of organic life at various levels for determining the incidence of life in these particular ocean waters.

Several days of quiet, cold, but clear weather with occasional strong winds have gone by. At 1400 hours, on 25 April, ice pressure to the south increased. It was not long before a crack was seen moving from the south to the north through the entire ice field at a distance of 100 meters to the east of the hydrologic tent. In some locations, the crack was up to 5 meters in width and continuing to broaden. After reaching a width of 10-15 meters, it became static.

The motor of the helicopter was warmed and the aircraft was dispatched to verify the condition of the airdrome. It appeared to be whole, although around the ice floe a number of cracks and pressure ridges were observed.



Three days later, a low overcast appeared and the wind freshened. A crack began to form and great walls of hummocks were created. To the west of the camp they were made up of young ice, but to the south, quantities of old ice were heaped up. After an hour, pressure ridges 2-3 meters high could be seen.

Throughout this tense period, however, work continued at the station. We were particularly impressed by the station mechanic, Mikhail Semenovich Komarov, who is well known to Soviet polar workers. Komarov maintained his schedule of work and soon completed assembly of the tractor. The other members of the station remarked during this period that if Kamarov were to fall into the open crack in our floe, he would sink to the bottom like an ax, such was the storehouse of bolts, nuts, and spare parts he carried in his pockets.

The last days of April have been full of activities. In the period between scientific observations, we have received cargo delivered by aircraft and have constructed an ice house which we refer to as the Snezhnyy Dvorets (snow palace). We are preparing to welcome the first of May, and each tent flies the national flag. In the center of the camp we have constructed a rostrum of snow block.

On the first of May, our station received visitors, members of the high latitude expedition of Glavsevmorput'. A meeting was held followed by a dinner and, in the evening, a film was shown.

On the following day, our coordinates were 87-11-97 N and 177-34-08 W. Our ice floe is proceeding quite rapidly to the north with temperatures ranging near 18 degrees below zero. During this period, we have had alternating clear weather and heavy fog.

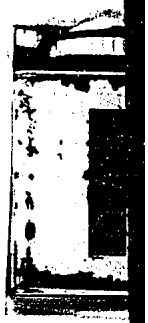
On 4 May, our drift increased rapidly to the north. The wind during the day occurred from all directions east, north, west and south. At our precise location it was clear but fog could be seen on the horizon.

Everyone is a little saddened (although no one mentions it) because the work of the high latitude expedition is coming to an end, and its members will soon be leaving for the mainland. Soon, only we and the staff of the polar station Severnyy Polyus-4 will remain in the Central Arctic.

The entire day is now light, with no differentiation between night and day. The ice floe on which we are located is carrying to the southeast. In Moscow now, the air temperature is 23 degrees, but here it is 20 degrees below zero.

I. Kotov has arrived to deliver a piano sent by the polar workers of Mys Chelyuskin. On the same flight, several members of the expedition (including V. Burkhanov) visited the camp.

In the course of the week 8-15 May, very high pressure occurred as an anticyclone formed. During this period, portable houses were delivered to the camp and we rapidly set to work to assemble them. The foundations of these houses are heavy runners covered with arktilit [see 00-W-31152 for description of arktilit] to which is attached the floor of plastic sheets covered with plywood. Vertical walls are then raised and attached to the roof. For light, windows of plexiglass are installed. Cracks are filled with strips of felt, then plinth is nailed into place and floor covering laid. We decided to place two of these houses together to serve as a company room and mess hall.



It is snowing from time to time and the crack is hummocking slightly.

For 3 days the weather has been so cloudy that we have been unable to determine the coordinates of the station. Shamont'yev has raised the first bottom sample with the sounding winch. At a depth of almost 4 kilometers, a core sample was taken and will be studied in the chemical laboratory.

Not until 13 May were we able to determine our coordinates. At this time they were 87-02-00 N and 176-13-01 W. Shamont'yev and Dmitriyev have been taking deep-water hydrological stations almost all day.

The weather is worsening with a decrease in pressure and a freshening of the wind. With the wind changing in a counterclockwise direction, our floe is drifting to the east. During the night of 16 May, snow fell almost continuously.

On 17 May, the wind reached a velocity of 21 meters per second, and a snow storm began. The second half of the day, when the weather improved greatly, the plane piloted by Ivan Ivanovich Cherevichnyy arrived. With him was another member of the high latitude expedition, Mikhail Yemel'yanovich Ostrekhin, a well known polar researcher. They continued on to Moscow, leaving with us winches, tents, and other equipment for hydrological work. With the departure of the aircraft piloted by I. Cherevichnyy, only the staff of the two Soviet scientific drift stations remained in the Central Arctic.(2)

Summer Begins

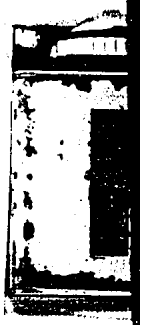
It has been cloudy since the morning of 20 May. The ice is enveloped by fog mixed with drizzle. On such a day it is especially pleasant in the company room where the latest addition of our own newspaper, In the Ice, may be read. This newspaper is published on the ice floe and contains articles on work in the Central Arctic, discussions of serious questions, short notes of life on the ice, letters, cartoons, and other things.

On the walls of the company room there is a large map of the Central Polar Basin which Magnetologist Popkov uses to trace the route of our drifting station. Here also is a large chessboard replica on which we trace the moves of the match we have begun with the station Severnyy Polyus-4. The company room also contains a library which is maintained by Igor' Tsigel'nitskiy. In the center of the company room members of the station play dominoes or chess, and Dr Velovich may often be found seated at the piano.

21 May. There is almost no wind. It is very warm and a wet snow is falling. Around us to the southwest a dark patch may be seen in the sky, which may prove to be either water, sky, or fog.

On 1 June, summer began for us although the temperature of the air was 10 degrees below zero.

The hydrologists are continuing to take bathymetric stations and to take plankton samples in the upper ocean layers. The first results of their work, completed in May, have been sent to Moscow and the Arctic Scientific Research Institute in Leningrad. Warm days have begun and the snow is quickly melting. The snow palace has begun to break down and soon the ice houses will be reduced to small lakes.



On 7 June we had an enjoyable day. The aircraft piloted by Il'ya Pavlovich Mazuruk arrived to deliver vegetables, fruit, letters, newspapers, and magazines. The aircraft crew moved from the airdrome to the station in the helicopter. Upon their arrival at the camp they were welcomed as guests and Il'ya Pavlovich noted that this was the first year he was eating tomatoes for the first time at the North Pole rather than in Moscow.

The program of scientific work for the station contains a study of Arctic Ocean depth, not only at our particular ice floe, but also at a distance of 100-150 kilometers from the camp. This would make it possible to carry out hydrologic studies on a wide band of still uncharted and unstudied Central Arctic. Accordingly, a number of temporary research stations have been set up with the aid of the crew of our helicopter.

On 9 June, the weather became clear and quiet. The crew of the helicopter took off with V. Shamont'yev and K. Kurko to take hydrological stations to the south. A message arrived soon that a landing had been accomplished on the ice. To the north a heavy fog could be seen approaching rapidly and soon covered the ice floe. Two hours later, Kurko radioed that the fog had reached the locality of their landing. In the second half of the day, however, the fog cleared and the sun appeared once again. At 1730 hours, a communication was received from Kurko that the hydrologic station was completed and the helicopter was returning to the drifting station.

Three days later, the helicopter flew to the north, and oceanographers took a hydrologic station at 87-40 N and 162-00 W.

Fourteen June marked the second month since the day the station began operations and dispatched its first communication by radio to the mainland. The practical results of our observation are already being delivered to scientists and those charged with Arctic navigation.

It is cloudy and raining periodically. Under the snow cover, more and more water is forming and threatening the tents and houses. We have decided to utilize the established method for dealing with the water problem and have drilled holes in the ice through which the melted water could flow.

At a distance of 200 meters behind the aerological area and the helicopter landing space, we have discovered that a crack is forming in a westerly direction, cutting off a corner of the ice floe. This crack, which appears as a dark narrow line in the snow, had been noted several days before, but as long as calm weather prevailed it remained static. The arrival of westerly wind has forced the crack to break open.

A survey flight has been made during which it was noted that still another crack has formed in the northeastern part of the ice floe. At a radius of 10-15 kilometers around the station, there are many fresh cracks, some of which are 15 meters wide. The surface of these separations is clear, with no indication of ice formation on them.

During the last 10 days of June, the weather was alternately sunny and foggy. Radiograms continued to arrive at our station, and the polar aviator, I. Bakhtinov, arrived by aircraft at the station with newspapers, periodicals, and mail. On the evening of 29 June (while we awaited the solar eclipse of 30 June), a wind came up from the northeast. Simultaneously, the sky was covered with cirrocumulus cloud formations and other indications of imminent bad weather.

On the morning of 30 June, it was windy with the overcast becoming increasingly heavy. By noon it was completely overcast. At the beginning of the solar eclipse, a clear area appeared in the overcast and in the lower right corner of the solar disk a shadow appeared. This shadow began to cover the lower part of the sun when the entire phenomenon was blocked out by thickening overcast.

On 2 July, an exploratory trip was made in the helicopter. During this flight, in the broad open water areas we observed great quantities of light brown algae and two seals. The animals quickly disappeared into holes or cracks in the ice. Here in the Central Arctic, there is life both in the water and on the ice.(3)

Guests From the Mainland

A strong wind is continuing from the southeast and our ice floe is moving to the north with considerable speed. We are unable to determine our coordinates due to heavy overcast and intermittent wet snow.

On 4 July, the wind was easterly but a change to northerly was indicated. In the evening, as we had forecast, the wind freshened, swung to the north, and was accompanied by heavy snow. This developed into the most severe cyclone we had experienced in 2 1/2 months in the Central Arctic. At this time the pressure dropped to 732 millimeters. According to our "news by radio" report, the air temperature in Leningrad was 29 degrees and in Moscow 26 degrees, while at our station we were experiencing this purga with heavy snows.

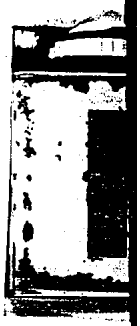
The strong northerly winds are continuing and our ice floe, which was drifting to the north, is now beginning to drift to the south with undiminished speed.

On 5 July, after dinner, I left the company room and sighted two small flights of birds which proved to be sea gulls. The entire company came out to see these rare vistors to the high northern latitude.

On the following day the wind continued to rage, whistling loudly through the radio mast and other structures. Within the houses, the wind sounded like a deep roar and in the tents everything swayed and creaked as a result of it. I made a tour around the camp at this time and found heavy snow deposits everywhere. This powerful cyclone which was passing over our ice floe apparently arrived from Zemlya Frantsa-Iosifa. In a little while, the strength of the wind began to decrease, but on 7 July, the wind rose again and the snow began falling.

The helicopter was dispatched to survey the camp's surroundings. On the southeast side of our ice floe the crack has closed and is covered with snow. We sighted a seal, which was on the ice next to its blowhole, and our navigator A. Minakov shot it from the cabin of the helicopter. When we landed, we found that this animal weighed 40-50 kilograms. We loaded it into the helicopter and continued our exploratory flight. The airdromes and the emergency area which we had prepared during our flight of 2 July appear to be in good order.

Guests arrived by aircraft from the mainland shortly after our survey flight. These visitors are members of the various scientific research divisions of the Academy of Sciences USSR, including the institutes of oceanography, microbiology, geology, and frost studies. The visitors became acquainted with the staff of the station and gave scientific consultations on various questions of interest to us. The hydrologists, together with Prof A. Ye. Kriss, took bottom and water samples for microbiological analyis.



P. A. Shumskiy, Doctor of Geographic Science, was interested in crystalization research on polar ice. He emphasized the importance of continuing our work in this field, and asked that in the winter time an ice sample be sent to Moscow to the frost studies laboratory for precise studies.

It was later suggested that research on geology, geomorphology, and hydrobiology be significantly broadened at the station. For these purposes new apparatus is being prepared. Additional research will aid studies on the history of the formation of the Arctic Ocean and more precisely establish the relief of its bottom.

Our hydrologists are employing small nets to gather plankton samples. The quantity of plankton in the upper ocean layers is becoming significantly greater as summer makes itself felt. Many small jellyfish have also been encountered. A small trawl which was employed recently brought up pebbles, small bivalves, crayfish, coral, and two small sea urchins.

When working with Moscow, our radio operators ordinarily transmit all communications through intermediate stations, but there are days when direct radio communications with the capital are established.

By the end of July, an over-all snow cover of 50-80 centimeters had formed on our ice floe. Water beneath the snow was not rolling off, and the increased weight of this water and snow had lowered the level of the floe to a point where its upper surface was almost even with the ocean level.

In the second half of the day, 30 July, we noted that the level of water in the snow in the camp area had significantly lowered, which indicated that the ice was rising. With Babenko and Komarov, I made a survey of our ice floe. We found water everywhere although it was true that in some areas it was in small quantities and strips could be picked out for landing wheeled aircraft. The most advantageous place for this purpose was along the crack on the northern side of the camp.

We set to work immediately. Choosing a suitable site for a landing strip, we began boring holes in the ice along the side of it. The water rapidly flowed out beneath the ice through these holes, forming a dry strip.

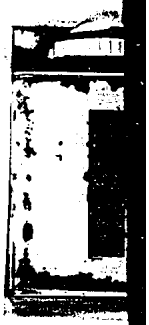
August has begun with heavy fog. We received a radiogram from the flier Osipov, who reported that he would soon be over the station and would drop mail. As a result of the fog and mist, however, we could not determine when the aircraft was above the camp and his mail drop missed the indicated location.

The personnel at the station set out immediately to search for the mail pouch. The ice floe was covered with people, led by A. Komarov in the automobile. Before long the mail pouch was located and returned to the company room in a truck.

Two days later, from beyond the hummocks, where there was still a layer of fog, we heard an aircraft engine. Kurko reported that Perov was arriving.

Komarov lit the signal cartridge and a ribbon of smoke extended across the ice. A minute went by, then another, and the aircraft landed on the ice.

Unloading of the aircraft began immediately, with work progressing rapidly due to the possibility of worsening of weather conditions. We unloaded crates and bags of fresh vegetables, potatoes, and other food stuffs sent from the mainland, in addition to quantities of mail.(4)



Arctic Workdays

Our normal workday at the Arctic scientific drift station is about as follows:

At the aerological section, a special apparatus is operating to produce hydrogen which is used to inflate the white balloons. Precisely on a predetermined schedule, the balloon with its suspended radiosonde is released. For more than an hour thereafter, the meteorologist remains in the tent at the receiver, rapidly noting the data on weather dispatched by the instruments from various heights.

In the tent standing to one side, the rhythmic sound of a motor can be heard. The hydrologists are raising a small tube carrying cylindrical bottom samples of the Arctic Ocean. This is not the first bottom sample that has been raised, and it has already been determined that the ocean bottom is composed of fine silt, yellowish gray in color. Special analysis of the bottom will be carried out later to determine how the bottom has grown and the speed of its deposit.

The sounding cable is then raised and the tube is replaced by a plankton net. The plankton net will collect small organisms at various ocean layers. At the completion of this operation a small trawl will be attached and for several hours will be dragged on the bottom to collect bottom fauna samples.

Meteorologist Matveychuk consults his instruments every 3 hours. On this particular day, Hydrologist Shamont'yev proceeds to study the degree of melting during the previous 24 hours throughtout the territory of the camp.

We decide to make a survey of our floe, and Komarov drives the truck while we inspect the furthest limits of the floe on which our station is located.

Upon our return to the station company room we find a group of men gathered around a tape recorder. A film is being shown today and the projector and the screen are already set up in the company room. In several minutes all will be ready, but Aerologist Poslavskiy has still not completed the reception of the signals from the radiosonde, and in the middle of the show, Meteorologist Malkov will be forced to leave to take barometric pressure readings. Such is our day at Severnyy Polyus-3.

On the morning of 9 August, when I made a flight in the helicopter, I found that our ice floe was entirely surrounded by open water up to 1/2 kilometer in width. Our camp had become an island.

Toward evening it has become considerably colder and the westerly winds have shifted to southwesterly. In the west and northwest, the separation has increased in size. Waves appear on the water surfaces of these separations, and along their edges tremendous hummock have formed.

On 11 August, we noted a depth of 1,225 meters. It appears that we have arrived at the highest point of the submarine range imeni M. V. Lomonosov.

On the night of 20 August, southwesterly winds arose, reaching a velocity of 18 meters per second. To the west of the camp the separation became broader, its surface dotted with ice which had broken off our floe.

The separation nearest the hydrologic area had closed, but during the day when the wind quieted, it once again opened. A pressure ridge runs to this separation from the western separation.

On the morning of 12 August, the hydrologists began raising a small trawl which had been lowered the night before. Due to the strong drift of the ice floe, the winch cable had become buried in the ice at the edge of the sounding hole and it required considerable effort on our part to free it. In the trawl we found three bright red star fish. On exposure to the air, however, their bright colors faded rapidly. We also found a considerable number of spiral shells of both light and dark colors. The valves of the bivalve shells were larger in this particular sampling than in previous samplings.

Magnetologist Popkov and Navigator Minakov are always prepared for work, waiting by the hour for the sun to break through the overcast. It appears only briefly as a dim spot and is again rapidly covered. Coordinates are extremely important at this time in order to determine the precise location of the minimum ocean depth we have encountered.

We have finally obtained coordinates. On 20 August, they were 89-03.1 N and 151-46.4 W. It will soon be possible to stroll from one meridian to the other. This condition actually occurred 2 weeks later when the ice floe made its closest approach to the North Pole.

With an improvement in visibility we departed to the north in the helicopter. During this flight, Babenko approached to within 45 kilometers of the geographic North Pole.

On 13 August, ice convergence and hummocking began around the camp, and a heavy pressure ridge pressed against the hydrologic tent. It was apparent that the Arctic autumn had begun. The snow cover has frozen sufficiently to support the weight of a man.

Shamont'yev has flown in the helicopter to the area of relatively shallow water. At 88-41 N and 170-00 W he completed a full deep-water hydrological station and made several precise measurements of ocean depth. The helicopter returned to camp on the next day.

The hydrologists reported interesting news on 25 August. The ocean depth during the past 24 hours had increased more than 1,500 meters to somewhat over 4,000 meters. On the same day, Popkov and Minakov worked out the coordinates of the station and established the fact that we were proceeding toward the North Pole itself. The ice floe was situated at a distance of 30 kilometers from the Geographic Pole on the 90th meridian of western longitude. At this point, in 1937, for the first time in the history of Arctic research, a Soviet aircraft completed a landing at the North Pole. It has been clear and quiet weather since morning and comfortable despite the fact that the temperature is 9 degrees below zero.

The drift of the station is becoming even more interesting. Below our ice floe, there are unusual changes in the relief of the ocean bottom. Depths are changing by day and by hour. In a 24-hour period, our ice floe drifts about 5-8 kilometers, and during this period, the depth changes 300-400 meters. While crossing the submarine range imeni M. V. Lomonosov near the North Pole, we found fluctuations of ocean depth of 1500-2000 meters in a distance of 8 kilometers.

Organic life on the ocean bottom in the area adjoining the range imeni M. V. Lomonosov appears to be richer than in other areas of the Arctic Ocean. On the slopes of the range we have found mollusks, worms, starfish, and sea urchins. It is true, of course, that these organisms are smaller than the same types of organisms appearing in southern waters.

Many new aerological observations have been made on the movement of air masses and cyclones. The latest indications are that the area of the North Pole is no less a part of the entire hemispheric system than any other area.

On 3 September, the ocean depth was 2,087 meters. We have passed to the western slope of the submarine range imeni M. V. Lomonosov. After a long cloudy period, the sun appeared on 7 September and our coordinates were determined. The ice floe is drifting to the east-southeast, and air temperature has decreased to 10-12 degrees below zero. The polar temperatures have resulted in a freezing of the open water areas around the camp.

The first heavy freeze (32 degrees below zero) occurred on 23 September. In the morning, we could observe only a red glow on the horizon, as the sun did not rise that morning. During clear weather, however, it is still light and even within the buildings one can read and write without artificial illumination. Two days later, the sun appeared in the camp for the last time, and for long months ahead would remain behind the horizon. Now coordinates will not be easily determined, for the sun is behind the horizon and stars are still invisible.

A purga has begun, with winds up to 20 meters per second which carry great masses of snow. The members of our station move about the camp slowly and with great difficulty.(5)

Polar Night

The wind has shifted to the west, and by 29 September our ice floe was moving to the east. The ocean depth has decreased sharply to 2,095 meters. Recently, we have experienced a great deal of frost as a result of the mixing of warm and cold air masses. We have been forced to lower the antenna several times a day to clean the ice from it. The work of the oceanography section has increased considerably. Each morning they may be seen in the hydrologic tent clearing ice which has formed over the surface of the sounding holes.

On the night of 4 October, I made a tour about the camp. The wind was fresh, and on the horizon, dark clouds could be seen. To the north, a star was shining. Everyone was not yet asleep in the camp. The light was burning in the mess hall and Leonid Razbash was returning to his hut with weather reports from polar stations, which he would use to make up a synoptic map. The aerologist tent was also lighted, as Kanaki bent over his table working on data from the most recent radiosonde ascent.

Five days have gone by and it has become consistently darker with the stars shining more brillantly. By 9 October, our ice floe was located at 88-52-07 N and 76-00 W as we crossed the submarine range imeni M. V. Lomonosov once more, but this time in the opposite direction.

The submarine range imeni M. V. Lomonosov plays an important role in the movement and distribution of water masses in the Arctic Ocean. Sharply different water depths have been verified on each side of the submarine range. At similar salinity, water temperatures on the bottom of the Atlantic depression are considerably lower than on the eastern or Pacific side of the submarine range. This indicates the unbroken extent of the submarine range.

In the eastern part of the Arctic Basin, at a depth of 75-150 meters, Soviet researchers have for the first time found a layer of water (apparently of Pacific Ocean origin) with temperatures higher than cold Arctic water. Signs of these waters have been found in the area of the North Pole itself.

Life on the ice is following its normal course with more and more material on the nature of the Central Arctic being amassed. We have held a scientific seminar at which the chief of the hydrologic section, Shamont'yev, gave a very interesting report.

[Note: It is interesting that Shamont'yev, just 3 years out of the Arctic Institute, has been placed in charge of the section over such experienced men as Dmitriyev.]

He stated in particular that the observations carried out so far have verified the complex composition of the submarine range imeni M. V. Lomonosov. Systematic soundings have indicated that the relief of the Arctic Ocean bottom in the area crossed by the submarine range is a veritable "mountain country" with spurs and independent elevations, all with extremely steep slopes.

We are regularly carrying on weather observations. Eight times a day we send information to the mainland where it is utilized by synopticists for composing forecasts. Twice a day, we sent data on meteorological observations at various atmospheric heights. These have a great importance for navigation along the Northern Sea Route and the forecast of ice extent on shipping routes.

Six months have gone by since the day we landed on the ice floe. During this time we have covered an irregular course of 1,150 kilometers and a straight-line distance of 450 kilometers.

We have recently contacted the Antarctic by radio and communicated with the sailors of the Soviet whaling flotilla Slava.

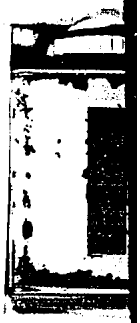
The synoptic map covering the area from the Atlantic Ocean to our camp shows a series of cyclones, one right after the other. The weather is depressing with no clearing, and the temperature has dropped to 13 degrees below zero. Our ice floe is drifting to the west, and as we move away from the submarine range imeni M. V. Lomonosov the ocean depth increases.

17 October. It is now full polar night with only occasional breaks in the overcast which allow the moon to bathe the camp in light.

Not too long ago, flights to the North Pole during the polar nights were considered an almost impossible task. In October, however, flyers of Polar Aviation have made many flights on polar nights and brought a great deal of material for the drifting stations Severnyy Polyus-3 and Severnyy Polyus-4. The crews of the aircraft commanded by Kotov, Shatrov, Titlov, Ositov, Bakhtinov, Zadkov, Cherevichnyy, and Mazuruk delivered various supplies including spare parts, fuel, and new houses.

The cold and wind have caused a great deal of difficulty. The astronomists have built a snow-block wall around their instruments (which are located in the open) in order to protect them from the strong wind. The crew of the helicopter maintain their aircraft in readiness at all times.

Between the houses, tents, and work areas, narrow paths are maintained through the snow drifts. At various points around the camp the lights of flashlights may be seen for it is now impossible to walk about without them.



On 16 November, our ice floe reached 88-17 N and 67-26 W. The last few days, the temperature has been 35 below zero with a westerly wind. We are drifting over the submarine range imeni M. V. Lomonosov, lying at a depth of about 1,200 meters. When Magnetologist Popkov determined our most recent coordinates it became clear that our ice floe is moving toward the Greenland Sea. It is drifting rapidly, having covered about 19 miles in 2 1/2 days.

Kurko has established direct radio communications with the Antarctic for the third time.

The weather is becoming colder and the moon has disappeared behind the horizon. We can see nothing about us and it is impossible to tell what is occurring beyond our floe, although we hear no sound of hummocking or ice pressure.(6)

Ice Hummocking Begins

The abundance of cyclones in the Central Arctic produces an unceasing movement of large ice masses. Sometimes in the camp we can hear thunderous sounds from the collision of these masses. With the increase in hummocking sounds, we have turned on our searchlight to aid the personnel of the station in surveying the edge of the ice floe.

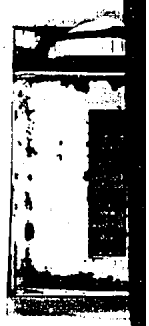
The aerologists have reported to me that to the south of the camp on 20-21 November, they heard pressure sounds in the area of the crack. We decided to make an inspection tour to determine what was occurring in the area. In making our way through the darkness with flashlights, we found that what had been a broad separation during the summer was now a small crack.

On the night of 23 November, Kanaki reported that to the north there were sounds of hummocking similar to the noise of a rushing train. The searchlight was turned on and several individuals proceeded in the direction from which the sound came. Three hundred paces from the camp, they found a separation covered with young ice. This ice had recently been forced up on our ice floe and formed a series of hummocks from 1 1/2 to 2 meters high.

Taking my carbine and flashlight, I went with Matveychuk to look over our ice floe. During the survey, we discovered that a fresh crack ran in an arc from the southeast through north to the northwest, at a distance of 250 meters from the camp. While we were inspecting the floe, this crack broadened to 10-20 meters.

At 1215 hours, Moscow time, on 24 November, heavy shocks were felt on the floe. The electric lights in my hut were extinguished. The door burst open and Babenko entered to report that a crack had passed through the entire camp. We ran to the crack and found that our ice floe had split in two and the camp was now divided into two parts which were rapidly drawing apart. Our searchlight indicated black water with thick steam hanging over its surface. In several minutes, the crack had reached a width of some 30 meters. Almost on its very edge stood the aerological area and the magnetological tent. The helicopter landing area was only 10 meters away.

On the other half of the ice floe, we could see the helicopter preheaters. None had been lost. After some time, the crack narrowed somewhat and a small ice floe appeared in the water area. We quickly dragged over a gangway and, using it like a bridge, began to transfer the preheaters to our half of the ice floe. The gangway sagged into the water, and it was extremely difficult to stand on the ice-covered planks. After some time, we were able to transfer all of the preheaters to our half of the ice floe.



For several hours, while the water area remained free from young ice, we perceived the sharp odor of sulfur dioxide. The reasons for this are not clear, but perhaps in the area of the Lomonosov range there is an underwater volcano. Anything is possible.

A part of the station staff remained on the far side of the crack. When the helicopter had been warmed up, Babenko delivered Matveychuk and several others to the far side in order to aid the meteorologists in moving their huts further from the crack. Unnecessary equipment was returned by the helicopter to our half of the floe.

In case of hummocking, the aerologist hut, which was nearest to the crack, would be heavily damaged, so we moved it away from the separation.

By 1900 hours, 25 November, it had quieted. The crack had frozen and was covered with thin ice. The inhabitants of the other part of the camp, or, as we called it, the "affiliate of Severnyy Polyus-3," came over to the company room for dinner.

The temperature has dropped to 38 degrees below zero and strong northern lights have appeared.

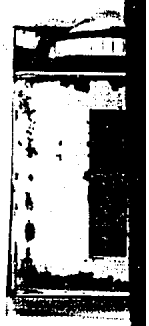
On 1 December, while I was sleeping, a light shock was felt through the camp. Our staff now slept lightly and immediately the area was dotted with flashlight beams as personnel left their huts. We were about to meet a new test. The territory of the camp appeared to be divided into many small blocks. A crack ran through the snow past the company room and almost into the hut where Volovich and Yatsum lived. From their hut, it continued to the frozen separation. Another element of this crack ran to the pressure ridge in the eastern corner of our ice floe. At 1215 hours, there was another tremor, and several cracks ran through the center of the camp.

This emergency meant immediate transfer to the southern part of the ice floe. While mechanic Komarov warmed the tractor engine with the preheater, we removed the doctor's and photographer's hut by hand. Finally the tractor was operating and began to move the huts: the company room, the radio room, and the hydrologist and aerologist living quarters. The transfer of the camp to a new location proceeded smoothly and without incident. The station personnel worked without interruption for more than 10 hours.

On 4 December, the moon appeared in the eastern part of the horizon in its second quarter, and became considerably lighter.

On 6 December, after supper in the company room, Oceanographer Legen'kov informed me that he had obtained a reading of 2,700 meters on the sounding winch and had still not reached bottom. This seemed extremely odd to me since 12 hours before, the depth was around 1,400 meters. We decided to verify this last reading and, together with Legen'kov, I went to the hydrologic tent located at the old camp site. Another measurement indicated a depth of 2,715 meters. I realized then, that we had moved off of the submarine range imeni Lomonosov. We left the hydrological tent and returned to the radio room where I lived, noted the depth on our bathymetric chart, and informed the radio operator, Leonid Razbash, that he could note in the log book that we were again over the Atlantic depression.

The moon is full and visibility has become excellent. On 8 December, we spent another sleepless night. A crack formed and soon broadened to 15 meters. Above the northern separation, clouds of steam formed. Our camp is again divided into two parts. The ice floes are in constant motion and those made up of old ice are riding under the thinner ice.



At 0900 hours on 10 December, Matveychuk called from the far side of the separation to report that the weather was worsening. Atmospheric pressure was dropping sharply with the approach of a severe cyclone. The sky was rapidly becoming overcast and the wind was freshening. At 1500 hours, we saw that the crack in the old camp was beginning to separate, and the water in this crack was heaving perceptibly. Once again we had been shown that ice cover moves under the influence of waves and water beneath the ice. These waves were formed as a result of sharp differences of pressure, produced by irregular wind force on the various surfaces.

Severe cold has set in, with temperatures of 44 degrees below zero. Our ice floe is drifting very little and it seems we are almost bolted to a single spot. In the second half of the day, 21 December, a general atmospheric pressure decline began and the wind rose. We could hear the sounds of hummocking and our ice sustained two severe shocks. From the north, ice pressure formed from recently created ice, and the crack between the base camp and the airdrome separated. Sleep came in snatches, and we were prepared to pull out at any moment.

The old ice floe where our camp is situated is riding under the younger ice. Cracks are forming below our very feet, and a major new crack is running throught the camp. Fifteen minutes passed without quiet as pressure ridges of young ice formed.

After several hours, the heavy hummocking has forced the edge of the old ice floe nearer and nearer to the camp. The night is pitch black as we are in the middle of the polar night. This is a serious trial indeed, but one which our young staff is working harder than ever to overcome.(7)

We Move to the South

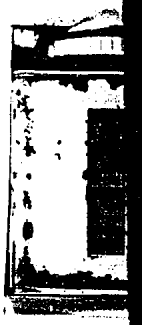
The winter season has increased our work, but the quantity of scientific observations has not decreased. The hydrologists regularly lower their instruments into the ocean, and the aerologists continue to release radiosondes.

After the heavy hummocking of 24 December, a period of quiet set in. We began to transfer to a new location for the third time, this time to a nearby, stronger floe. We widened a narrow passage which ran through the surrounding pressure ridges, and began moving the huts, tents, equipment, and gas cylinders by tractor. Komarov completed dozens of trips, working day and night for 3 days with very little rest.

Everyone has been exhausted by the work, but the security of the camp has been assured. The ice floe on which "Severnyy Polyus-3 number 3" (as we referred to the station) is located seems to be sufficiently strong, although it is only one sixth the size of the floe on which we landed in the spring. We have begun immediately setting up the camp on the new location, raising the radio station mast, and cutting new holes for hydrological research.

The new year has arrived, with temperatures of 44 degrees below zero and winds. Stocked with supplies flown in by I. Mazuruk, we celebrated New Year's Eve on the ice floe much as we have on the mainland.

In January, the ocean depth has varied sharply, from 1,900 to 3,385 meters. We have passed over the submarine range imeni M. V. Lomonosov again, and have arrived over the Atlantic depression. The hydrological winch has indicated a depth of 4,106 meters, the greatest depth found during the fall-winter period. A snow storm has begun and the heavy masses of snow suspended in the air have blotted out the moon. Snow drifts have formed between the huts, but we continue to transfer equipment from the old camp site.



Our ice floe is drifting to the south with considerable speed. On 14 January, our coordinates were 87-26 N, and on the next day they were 87-19 N.

By 19 January, we had crossed the 87th parallel. On the following day, stars appeared as the sky cleared, and it was no longer as dark as it had been further north. Although it has still not risen, the sun is drawing closer, and we can see the contours of the hummocks on the surface of the ice. Our ice floe is continuing to move to the south.

On 27 January, a narrow arc of the moon appeared and the sky slowly turned blue. The horizon line can now be determined at local noon--1600 hours by Moscow time. There has been no wind for the past 2 days, and our drift has almost stopped.

February has begun with extremely cold weather, temperatures of 43-47 degrees below zero. The snow crackles beneath the feet like glass. From 25 January to 5 February, the ocean depth has changed by only 10 meters, from 3,900 to 3,910 meters.

On 7 February, we wrote in the logbook, "A red glow appeared on the southern horizon at noon today." This was the first indication of the sun's arrival.

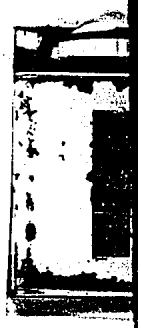
A series of cyclones has passed through our area with heavy snowstorms. The wind has increased to 10-14 meters per second with rapid changes in direction. On 12 February, hearing the sound of hummocking, I left with Volovich to survey the camp's surroundings. Beyond the separation which was formed during the summer, we could see fresh cracks and in the log book we added a new note: "The ice floe is surrounded by a great deal of activity. The separation is covered by young ice, but in places, cracks are piercing old ice. Along the entire southerly and southwesterly edge of our ice field, blocks 50-60 meters wide are breaking off." At the end of 3 days, as the movement and hummocking continued almost throughout the day, the logbook noted, "Pressure on our ice field has formed a series of hummocks 2-3 meters in height."

24 February. From 1500 to 2000 hours it was quite light with very good visibility. I have looked over the old camp site where the hummocks which formed in December are covered with snow. To the south, the cracking sounds continue and in the cold air they can be heard a great distance.

Mechanic Komarov is continuing to clear the area of snow drifts with his tractor, uncovering our emergency storage area filled with barrels of fuel and other material.

On 10 March, during lunch, the sun appeared. By 1700 hours, it was almost above the horizon. It has been 5 1/2 months since we have seen it, and today, as though on order, the sky is clear. For the first time since the beginning of the polar winter, Popkov is able to determine our coordinates by the sun.

We are drifting to the south. The coordinates of the station at 0500 hours on 18 March were 86-02 N and 34-32 W. Our ice floe has arrived at the 86th parallel, at which we were set down almost a year ago. This time, however, we are on the other side of the North Pole, 300 kilometers from the coast of Greenland.(8)



Return Home

The sun is rising higher and higher over the horizon, accompanied by strong refraction and curious configurations of the ice.

A northeasterly wind is blowing, but the drift of the ice to the west is not very great. The coordinates of the floe at 1900 hours, 25 March, were 86-02 N and 35-42 W. This fix indicates that the current and drift are acting in different directions.

On 26 March, we again determined the coordinates of the station and found them to be 86-01 N and 35-03 W.

For some strange reason, we are not drifting with the wind. We have checked this several times and it appears to be true. In spite of a strong wind, the slope angle of the sounding cable is only one degree. In comparison with the previous day's depth, our present depth has increased, although we expected it to decrease. The personnel of the station have all sorts of suggestions as to the cause of this phenomenon, but actually we shall have to wait to return to the mainland where we can study our gathered material to find the true cause.

It appears that winter is coming to an end, but today air temperature is 30 degrees below zero and the wind is increasing, bringing a purga with it. Snow is carried everywhere by the wind, and within an hour it seems there is nothing in the world but snow and wind.

At 0300 hours on 29 March, the sun had still not set. Its bright red disk rolled along the horizon and it was light throughout the day and night. The polar day has begun.

On 13 March, the sound of ice movement came from the north, but none of us even went out to look over the situation, we had become so accustomed to this phenomenon.

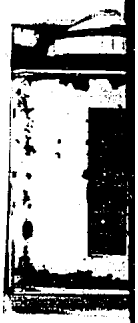
We have heard by radio from Moscow that a relief staff is being dispatched to Severnyy Polyus-4. We have 1 1/2 months of drift left before us, and then we will return home.

On 2 April, we observed an interesting phenomenon. On that date, when the ice parted along the crack, the water in the resulting lead appeared to "breathe." Short waves with an amplitude of 5-10 centimeters moved along the water's surface like a swell. At the same time, there was no apparent hummocking in the immediate vicinity. If there was hummocking it was far off, and in any case such waves should have been damped under the powerful ice cover, as an ice survey from the helicopter indicated there was no clear water present, at least within a radius of 50 kilometers. The ice was 10 points, with only narrow cracks appearing.

[Note: The expression used, "10 points," apparently is equivalent to the American ice-cover term 1.0, or complete coverage.]

All of this indicated that the waves were actually an undulation of the ice brought about by an unequal wind pressure on its surface.

The coordinates of the station are 86-03 N and 36-42 W. We seem unable to cross the 86th parallel.



A northeasterly wind continues to blow, but strangely our ice floe remains fixed. Throughout January, under a wind of similar velocity (but at that time in a northwesterly direction) we continued to drift to the south with a speed of 4-5 miles per day. It is difficult to determine the reason for this, since a land mass is still too far off to exert influence on us. It seems possible there is a counter current and if this is the case our observations will indicate it.

The night of 4 April was without rest. While surveying the camp, Geophysicist Kuchuberiya found that the crack had opened to a width of 10 meters in places.

Simultaneously, a wall of ice has begun pressing against the hydrologists' hut. In this emergency, the majority of the station workers arrived at the crack immediately. The ice floe seems to be breaking up beneath our feet, and a narrow crack is running through the camp, accompanied by a row of pressure ridges. The ice is rapidly settling below the hummocks. A southwesterly wind has finally arisen after many days, and this wind change is apparently the cause of the violent ice movement.

On 4 April, after lunch, everything is normal at the camp. The aerologists are sending off radiosondes and the hydrologists have begun preparations for current observations. The radio operator and meteorologist are working on the synoptic map.

At 1900 hours, the series of pressure ridges began moving again. The highest pressure ridge was pressing against the hydrologists' hut, but fortunately the pressure in this area has ceased.

The hydrologists have checked their recording current indicators and found that during the past few days there has been no current. The supposition that a countercurrent has prevented our movement to the west before the easterly wind, therefore, cannot be accepted.

The only remaining explanation seems to be that the corner of the Arctic Basin between northern Greenland and Ellesmere Island (the Lincoln Sea) is so clogged with ice that no westerly movement is possible.

At 1400 hours on 6 April, when I left my hut I was astounded. To the west and north I could see a vast stretch of open water covered by clouds of vapor. This was an incomprehensible phenomenon since only the day before the ice was solid for a radius of 50 kilometers with only very narrow cracks.

Beginning 14 April, we were in a constant state of emergency, packing and dispatching equipment of various cargoes. The huts have been dismantled and transferred by helicopter across the separation to the landing field. Only the company room has been left behind. The radio station has been transferred to a tent, and once again, as in the first days of our drift, we are living in tents.

Our station is located not far from the coast of Greenland. The ice floe has covered an irregular course of more than 2,000 kilometers and a straight-line distance of about 800 kilometers.

Yesterday, we finally crossed the 86th parallel, and it is apparent that today, 20 April, will be our last day on the drifting ice. I have congratulated everyone at the end of our drift, in which we have spent 376 days, the same period of operation recorded by the station Severnyy Polyus-2.

STAT

Kurko has dismantled the large radio mast and transferred the antenna to a temporary mast. We are spending our last hours in the camp. All our equipment has been loaded in the aircraft and part of it will be dispatched to the new scientific drift station Severnyy Polyus-5. In the aircraft piloted by I. Kotov (who left us at the station a year ago) we leave the ice floe and set our course for the mainland.(9)

SOURCES

1. Moscow, Vodnyy Transport, 9 Jul 55
2. Ibid., 14 Jul 55
3. Ibid., 23 Jul 55
4. Ibid., 28 Jul 55
5. Ibid., 9 Aug 55
6. Ibid., 16 Aug 55
7. Ibid., 20 Aug 55
8. Ibid., 25 Aug 55
9. Ibid., 30 Aug 55

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